Spatial Mapping of Soil Water by Electromagnetic Induction (EMI) Sensor

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REACCH
Regional Approaches to Climate Change – PACIFIC NORTHWEST AGRICULTURE

How do we understand changes in water temporally and spatially across a landscape?

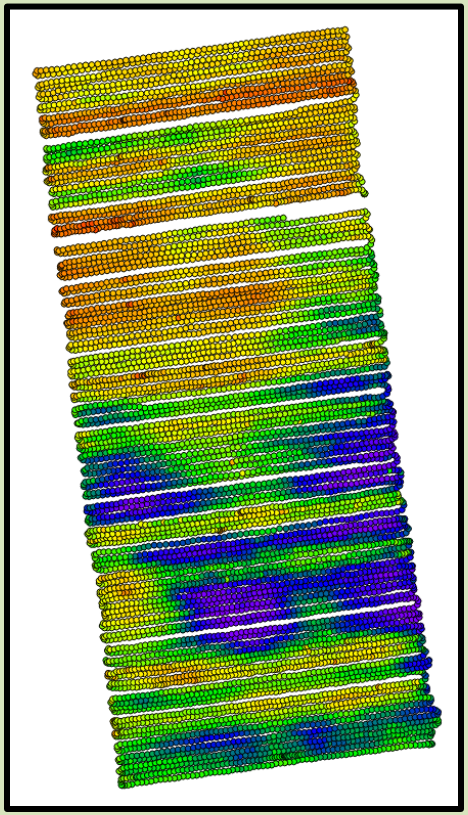
Spatial EC data represents spatial and temporal water patterns across a hill slope (Meerveld et al., 2009)

Point data can be used to calibrate EC data across a landscape using kriging and hard data points to test models against (Abdu et al., 2008)

Research question

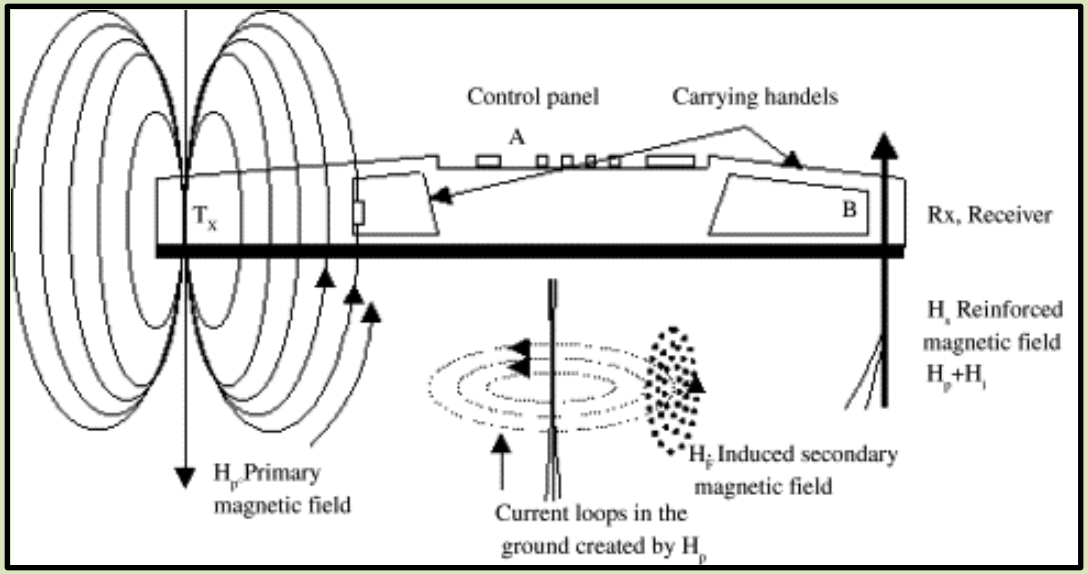
- How does EC data translate to soil water data?
  - Can we use known values at point locations to create a spatial model?

Photo by Meghan Wessel



EMI Background

- Function of the EMI

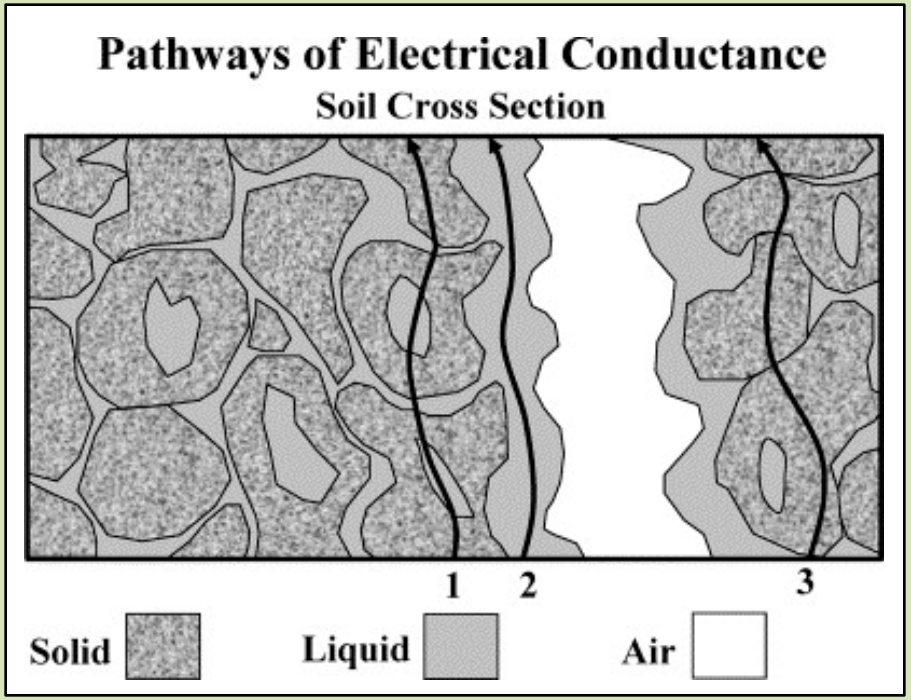


(S.M. Lesch et al., 2005)

Photo by Ian Leslie

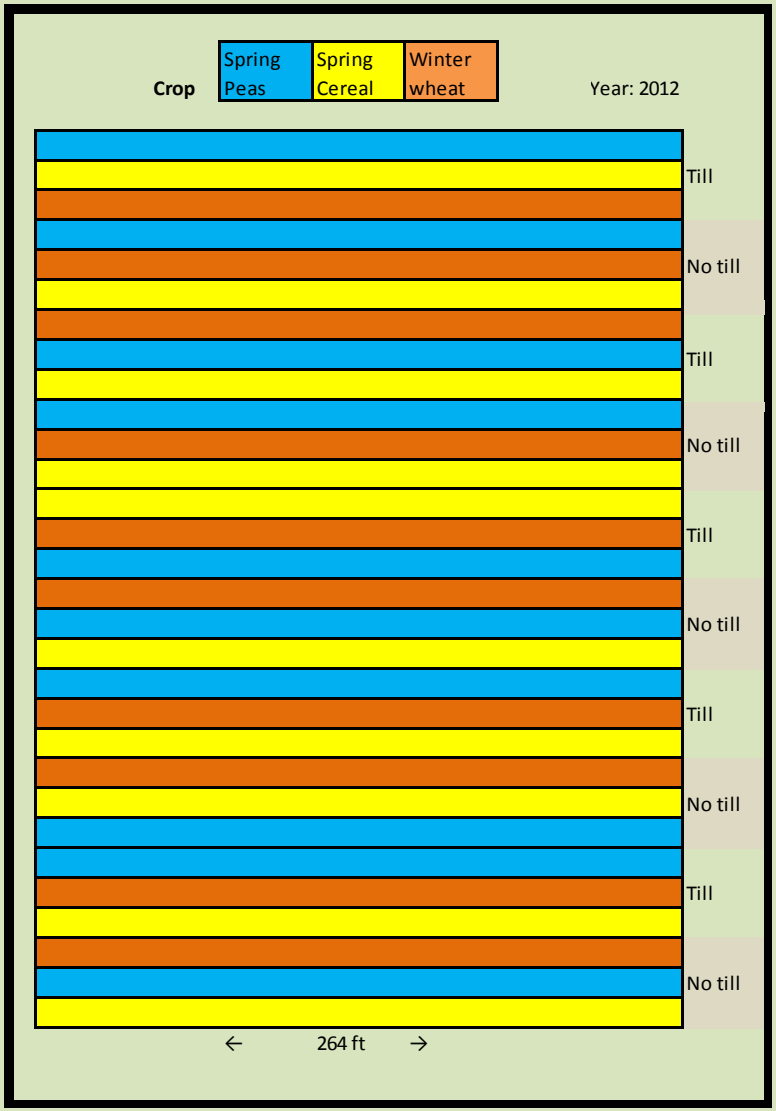
EMI Background

- Factors that influence EC
  - Salinity
  - Temperature
  - Porosity
  - Soil water content



(DL Corwin et al., 2005)

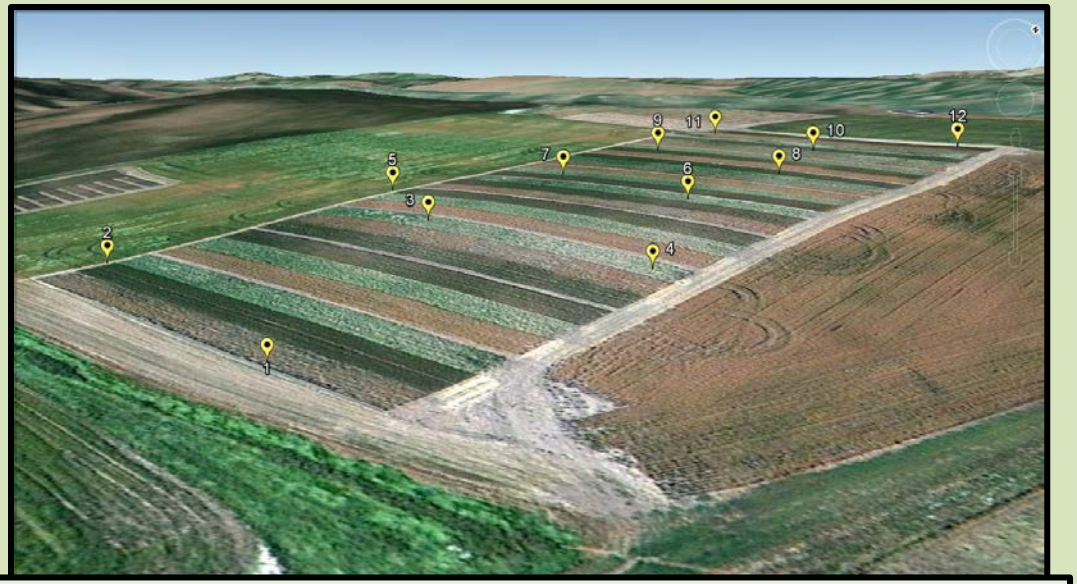
Kambitsch Research Farm



Kambitsch Research Farm

- Collected the point data:
  - Site
  - Elevation
  - Tillage
  - Crop type
  - Temperature
  - EC
  - Slope
  - Aspect
  - Soil water

Field Work



1. Walking the field with the EMI
2. Take the point data reading at the twelve point data locations

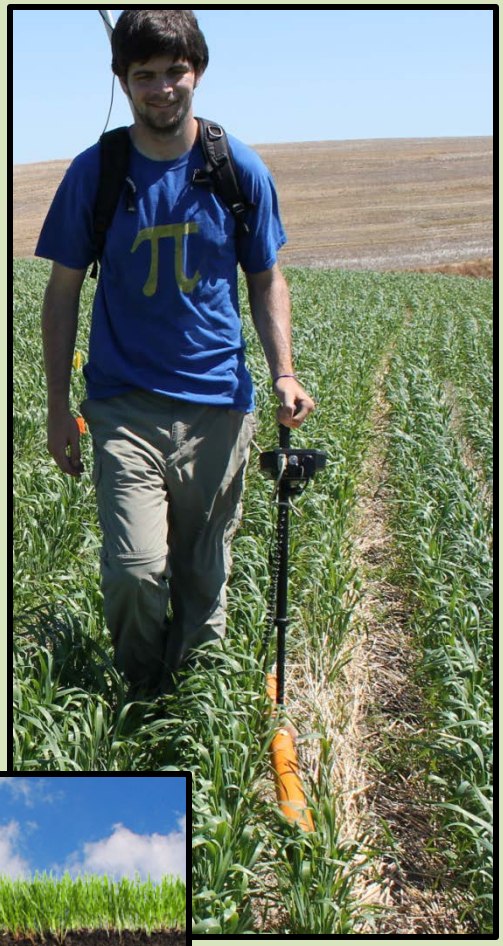
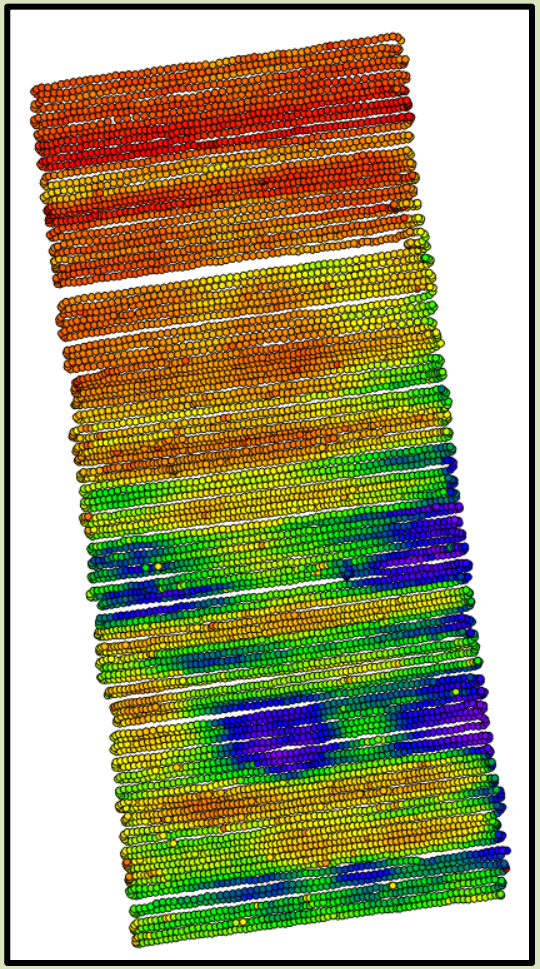
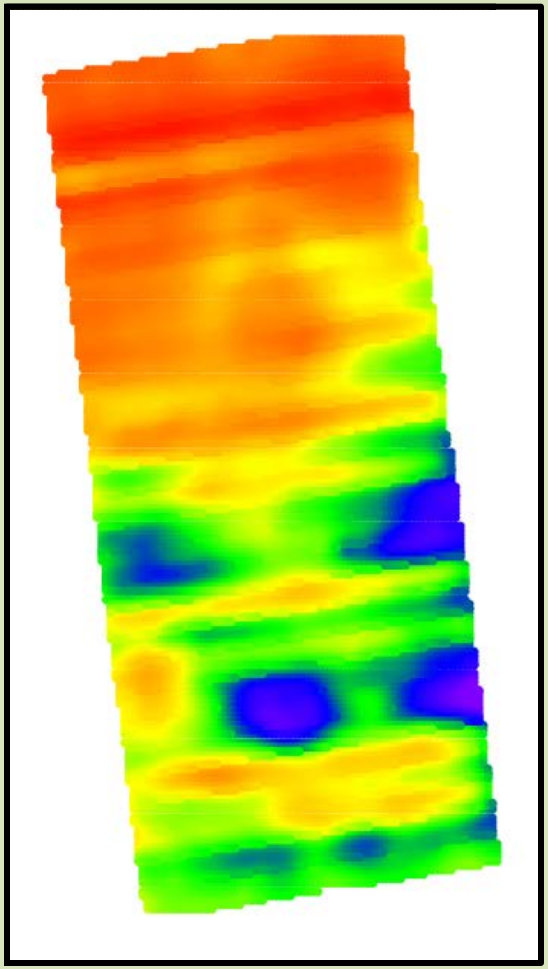
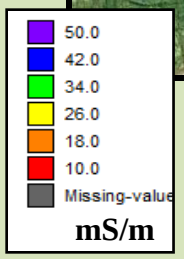


Photo by Ian Leslie

The Spatial EC Data







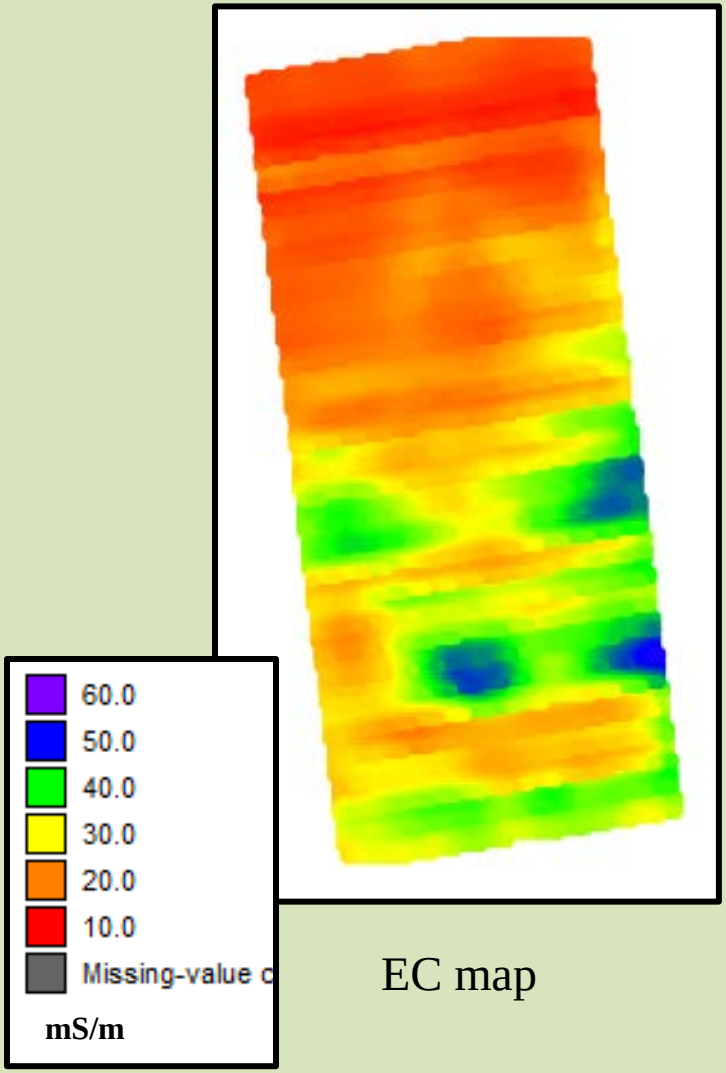
July 2nd

First Soil Water Model

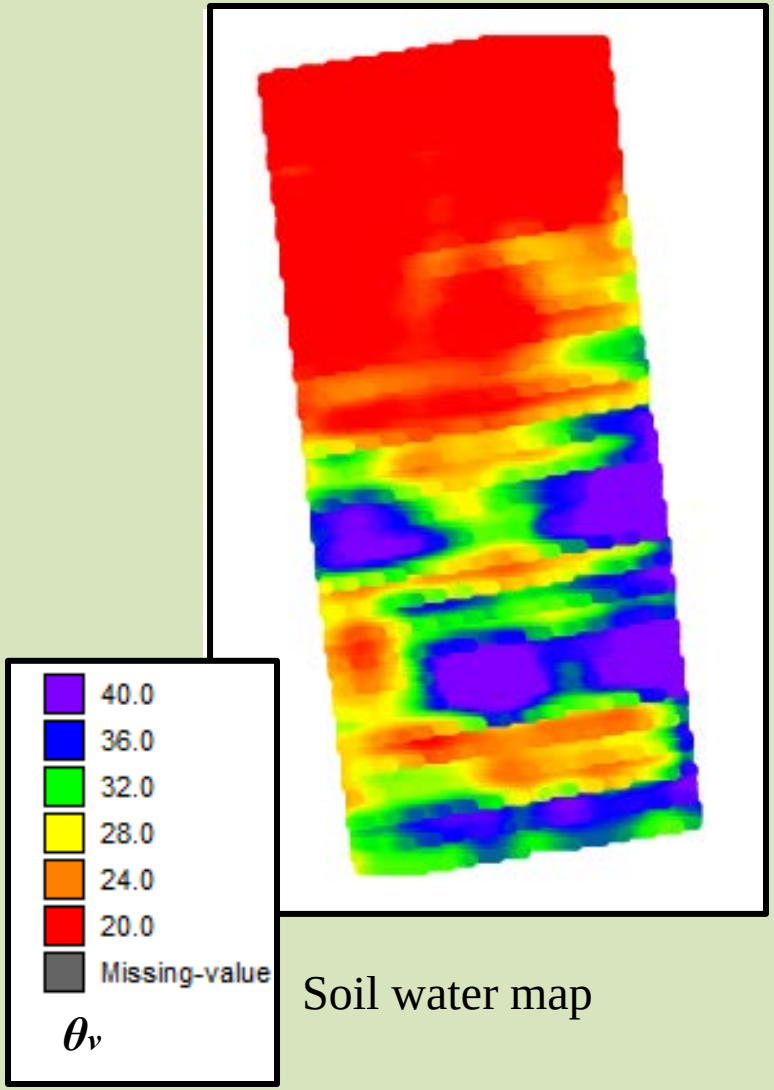
θv = 1.142 *ECa

R squared=0.1529

First Spatial Water Maps

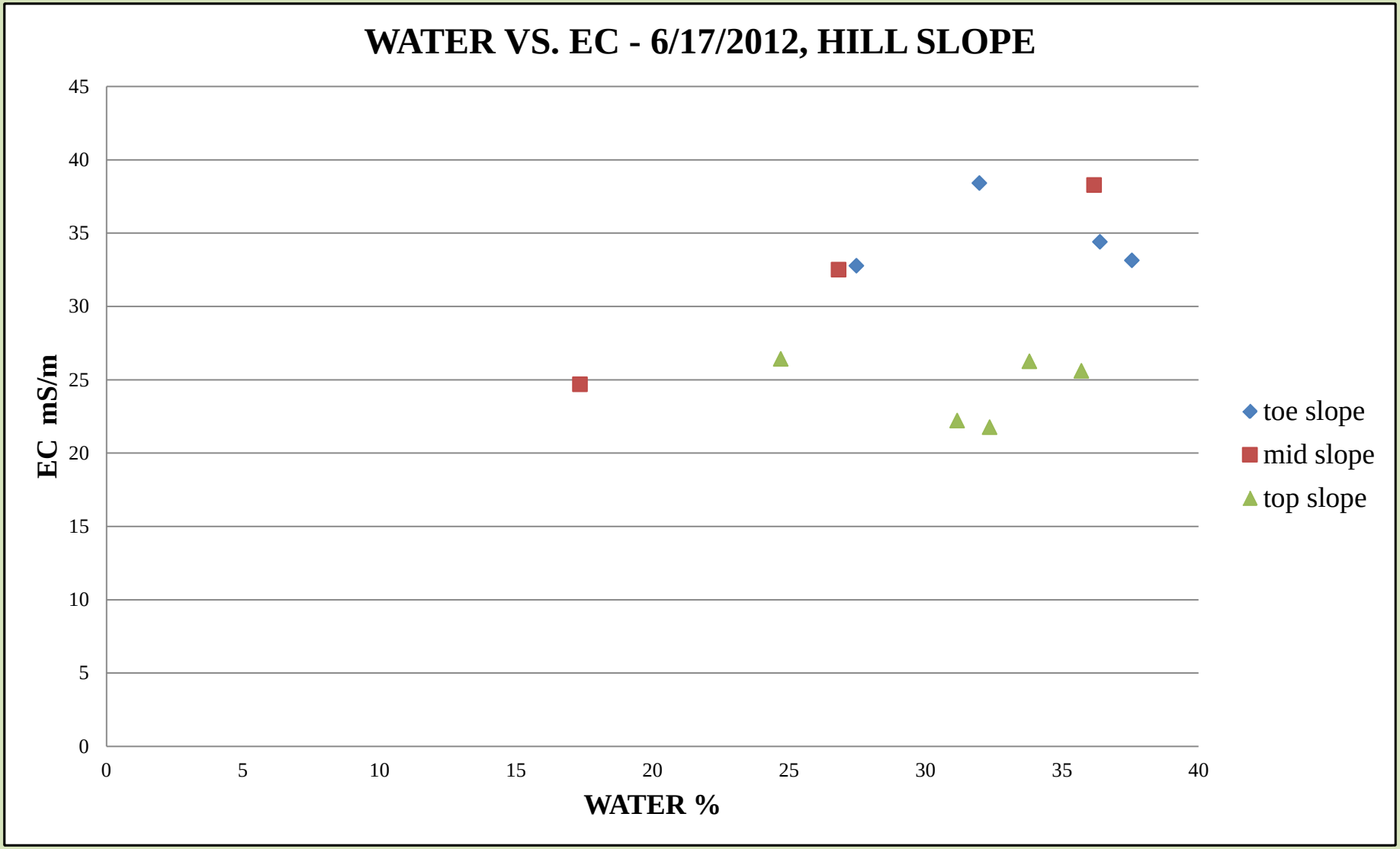


EC map



Soil water map

Data Exploration

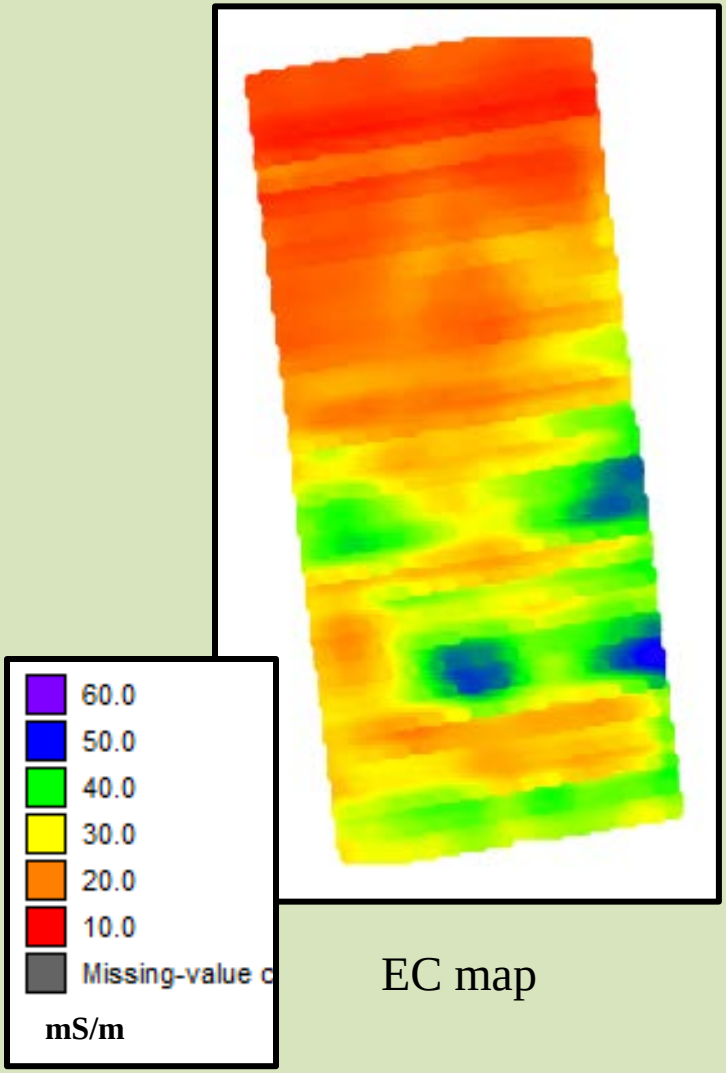


Second Soil Water Model

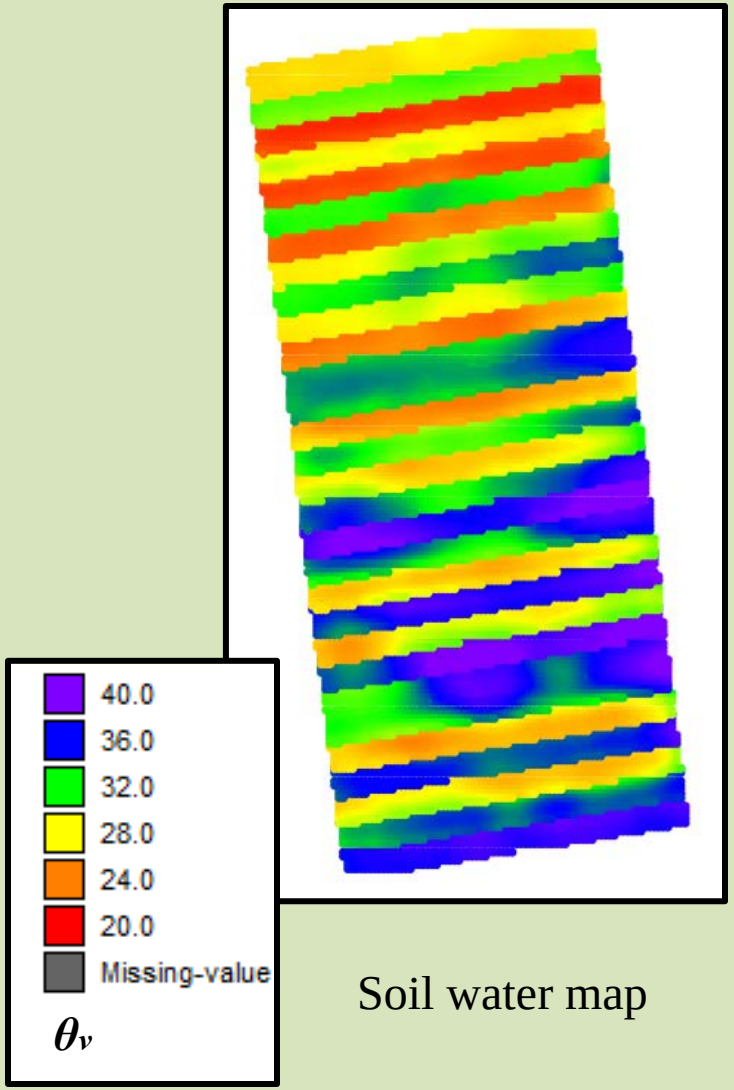
θv = -0.545859Elevation+4.50238Hillslope-3.60739Crop+0.439044EC+480.42

R squared=0.5855
RMSE=3.5849

Second Spatial Water Maps



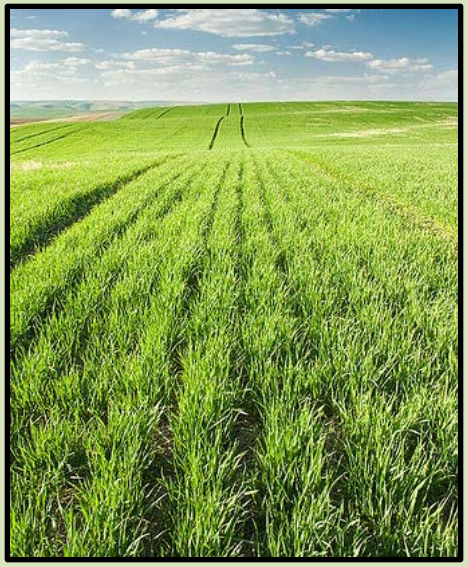
EC map



Soil water map

Experimental Limitations

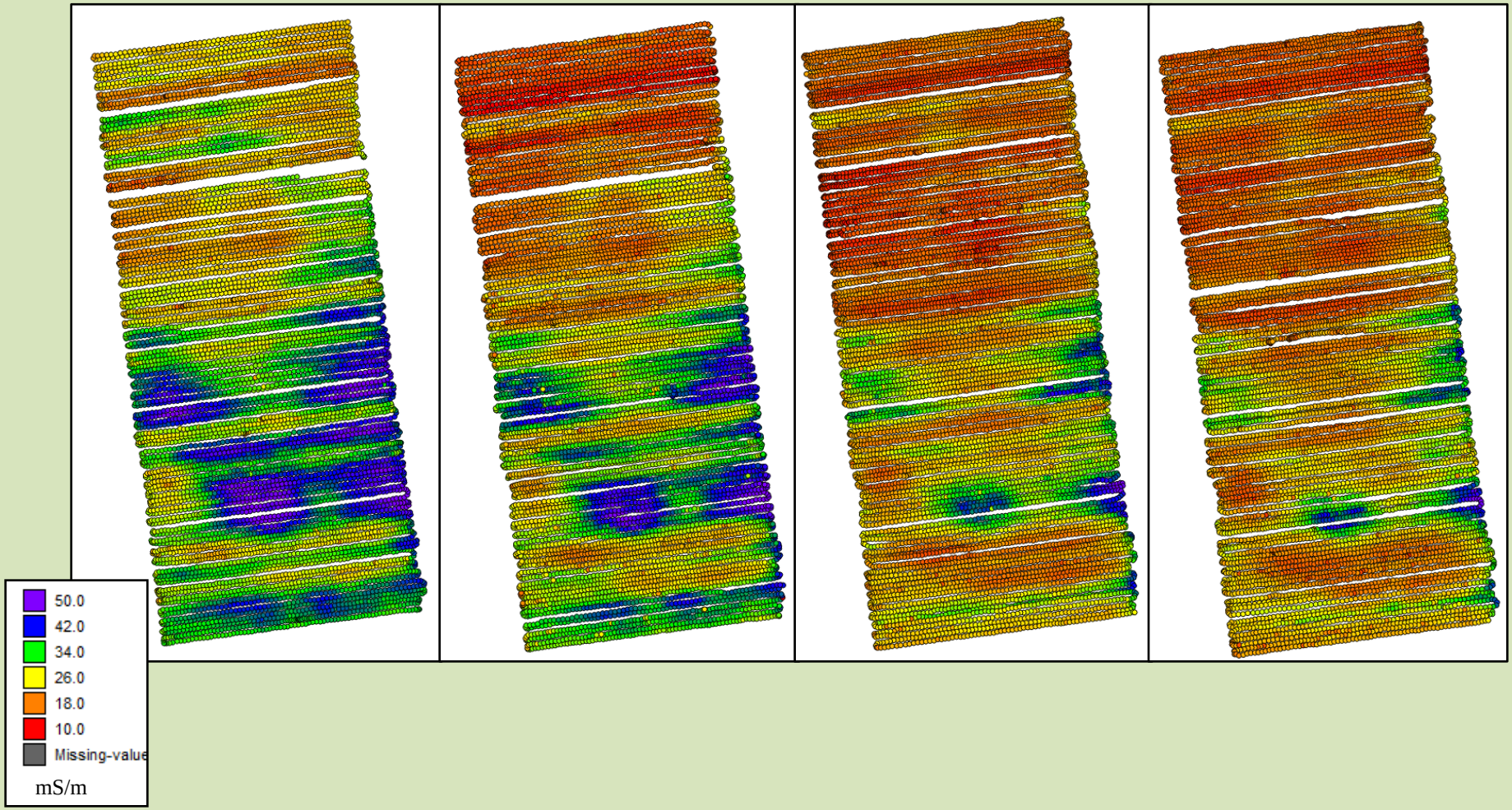
- Height of carrying and the effects of plant material



- Clay and salts across a landscape

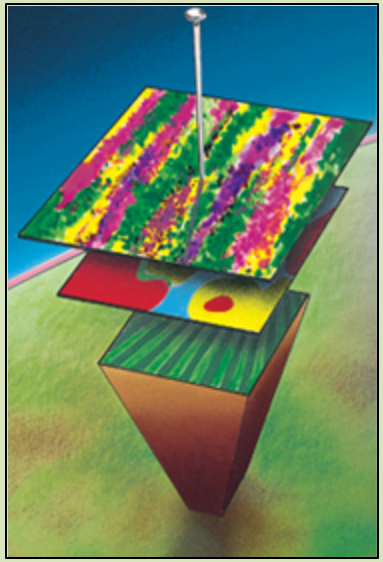
Temporal Data

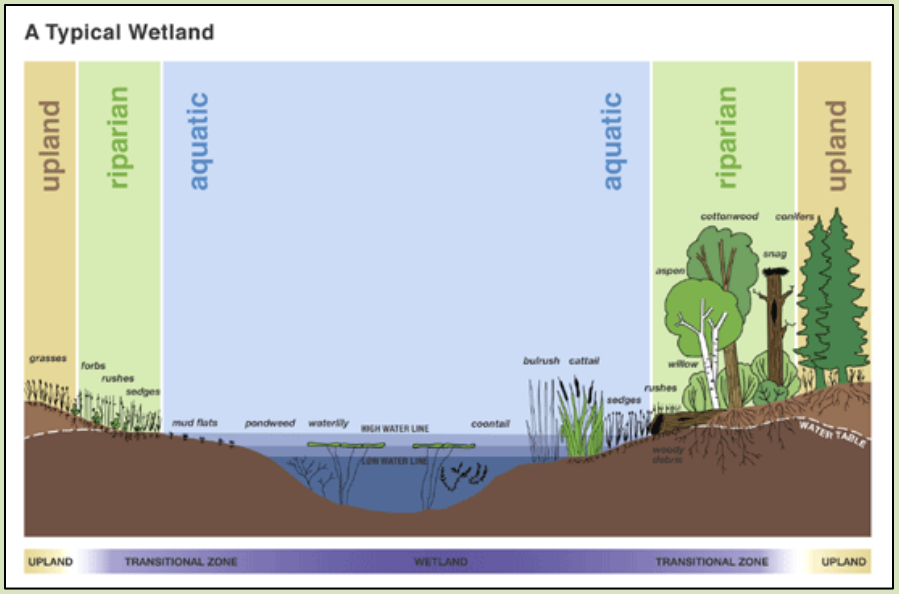
June 17th | July 2nd | July 11th | July 19th



Outlook and Ethics

- Matching land use with the landscape
- Explore cropping systems and other practices that influence water retention.





Acknowledgements

- Meghan Wessel
- Robert Heinse
- Ian Leslie
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